

Electric Distribution Program Multi-Year Research, Development, Demonstration, and Deployment (RD³) Plan Workshop



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Program Manager, Electric Distribution & *GridWise*

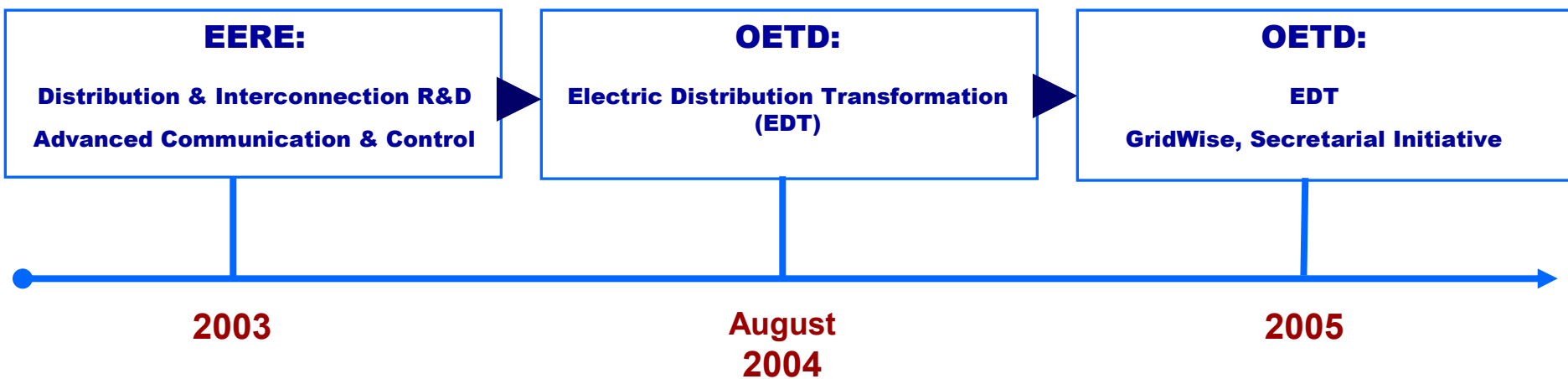
Electric Distribution Programs at the U.S. Department of Energy

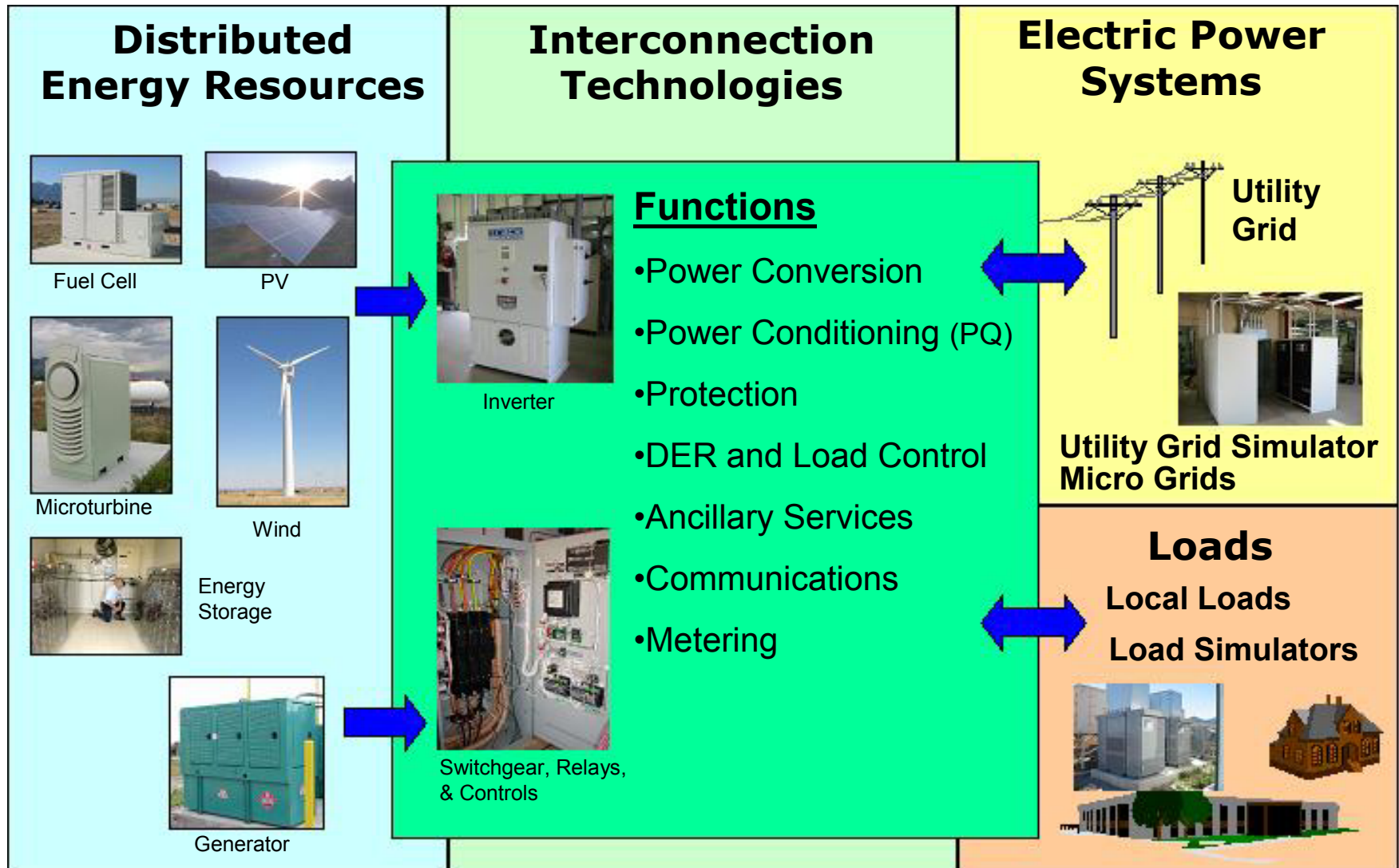
August 17 & 18, 2004 -- Oak Brook, IL



- **Programs**
 - Electric Distribution Transformation
 - GridWise
- **Program Focuses**
- **Strategic Objectives**
- **Ongoing Activities**
- **Budget**
- **R&D Collaborations**
- **R&D Public/Private Partnerships**
- **Multi-Year R&D Technology Roadmap**
- **Workshop Sessions & Co-Chairs**
- **Acknowledgements**

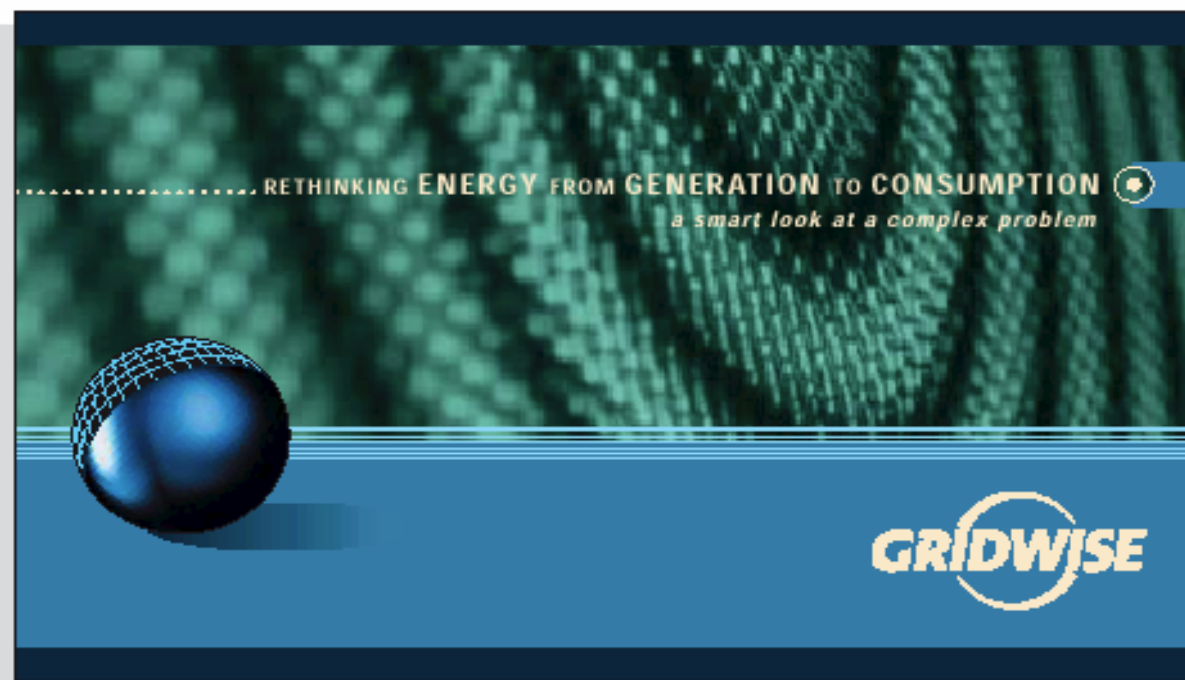
Electric Distribution R&D Programs



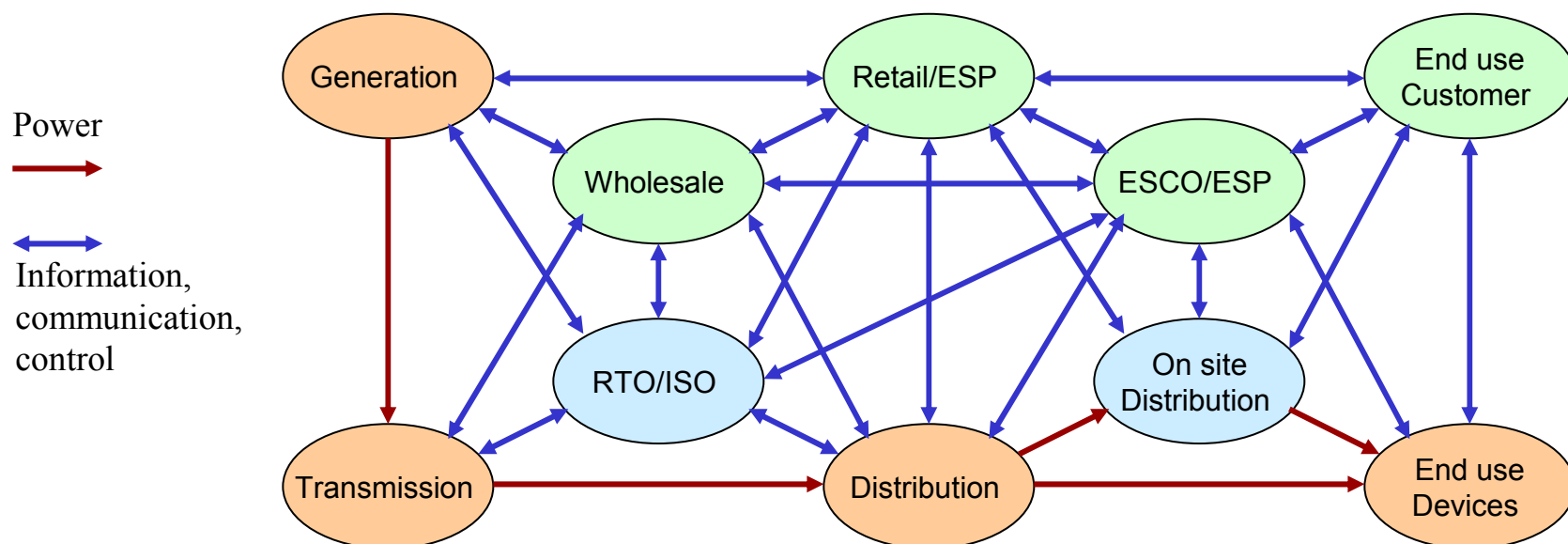


Apply advances in information/communication/control technologies to transform the electric system into a smart automatic network, with grid/market/customer price transparency

- Public/private partnerships through GridWise Alliance



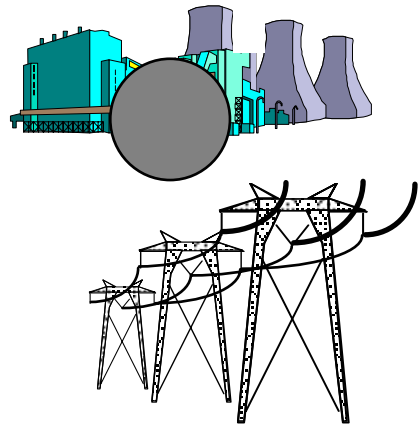
Integrated Infrastructure



**R&D on Advanced Sensor/Communication/Decision Technologies
to Seamlessly Integrate Grid/Market Operations**

Span of R&D Activities

Bulk Power



Transmission System

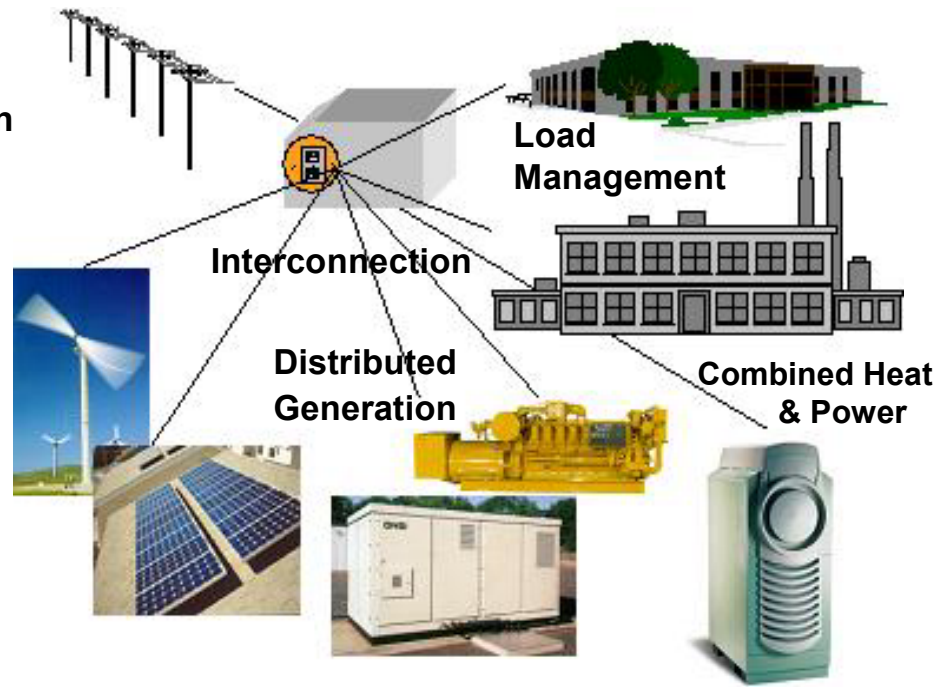


Distribution Substation

Adaptive and Intelligent Distribution System

Consumer Demand/Load Management

Market Integration



Links to

Enables

Enabling Platform:
Communication
Architecture/Standards
with Distributed Sensing,
Intelligence, and Control
Technologies

Distributed Resource Integration

Asset Utilization

Achieve the Grid 2030 Vision for

Reliability: self-correcting and resilient
Efficiency: integration of new technologies, DR, and DG
Affordability: consumer participation in load/demand management

Develop Critical Technology Identified in the National Electric Delivery Technologies Roadmap

Distributed sensors, intelligence, smart controls, and distributed energy resources

Implement the Northeast Blackout Report Recommendation

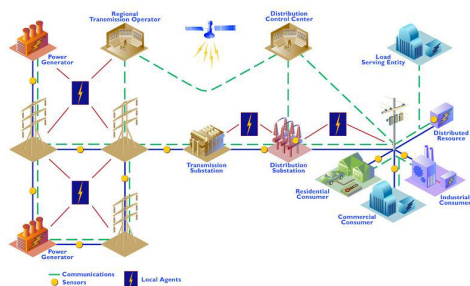
Improved capabilities and tools for system monitoring and management

Strategic Goals

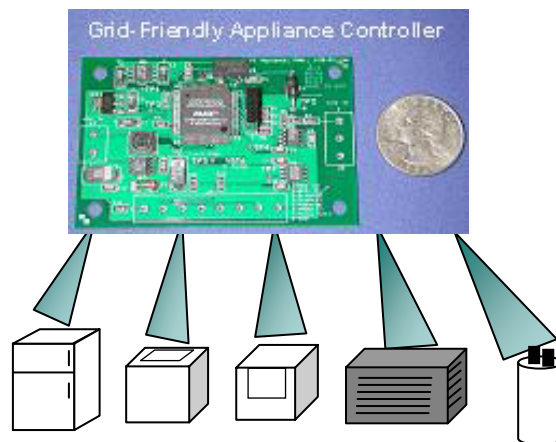
- Create distribution system **architecture and communication standards** to enable interoperability
- Achieve a **smart network** of distributed utilities for reliability
- **Reduce peak load** through consumer demand/load management
- Achieve an overall **interconnection cost reduction**



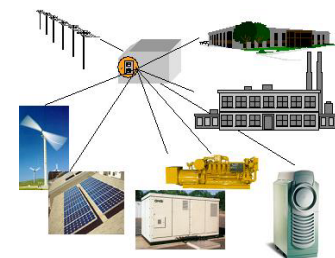
Related Standards



Distributed Sensing, Intelligence, & Control Technologies



Appliance Load management



Interconnection of Distributed Generation

■ GridWise Architecture and Standards, PNNL

- Architecture Board assembled to align structural framework and communication standards for interoperability



Ron Ambrosio

Manager, IBM T.J. Watson Research Center

Jay Britton

Principal Architect, AREVA-T&D Corporation

David Cohen

Acting CEO and CTO, Infotility

Rik Drummond

CEO, Chief Scientist, Drummond Group Inc.

Albert Esser

CTO, VP Technology, Emerson Network Power

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CTO, EnerNex Corporation

Stephanie Hamilton

DER Manager, Southern California Edison (SCE)

Larsh Johnson

President, CTO, eMeter Corporation

Jack McGowan

President, Energy Control Inc.

Vito Stagliano

VP, Transmission Policy, Calpine Corporation

Wade Troxell

Associate Professor, Colorado State University

Eric Wong

Manager, Bus Dev & Govt' Relations, Cummins Inc.

Vacant seat

(to be filled)

- **GridWise Alliance & Stakeholder Adoption, **PNNL****

Alliance Declaration Signed by
IBM, Alstom, PJM, UAI, Sempra, Rockport Capital, and Battelle (September 2003)



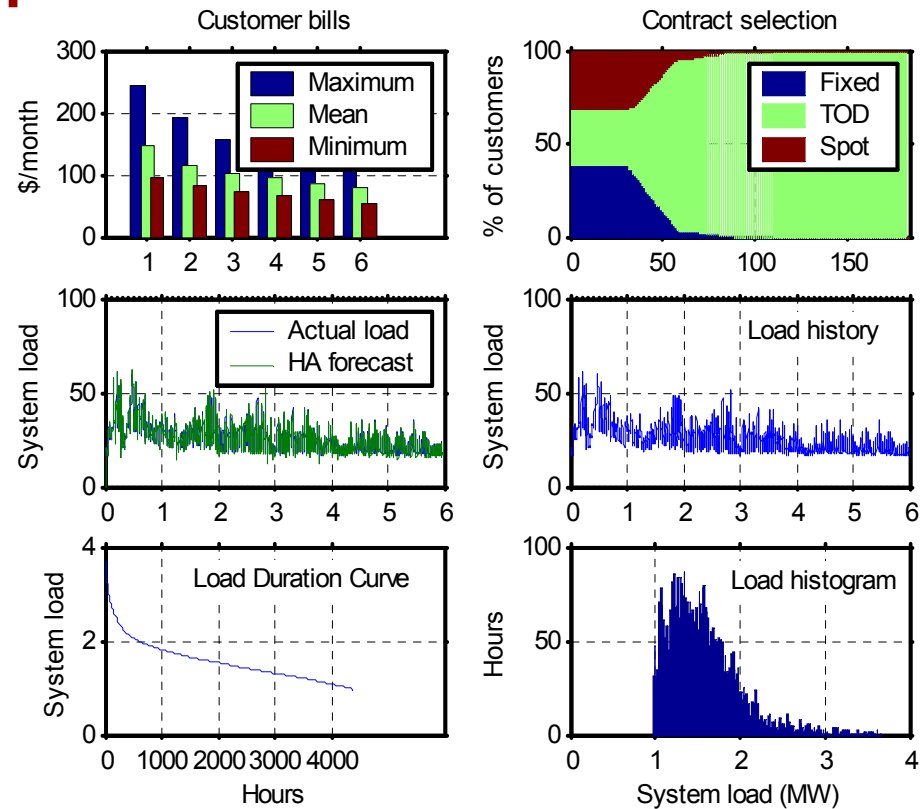
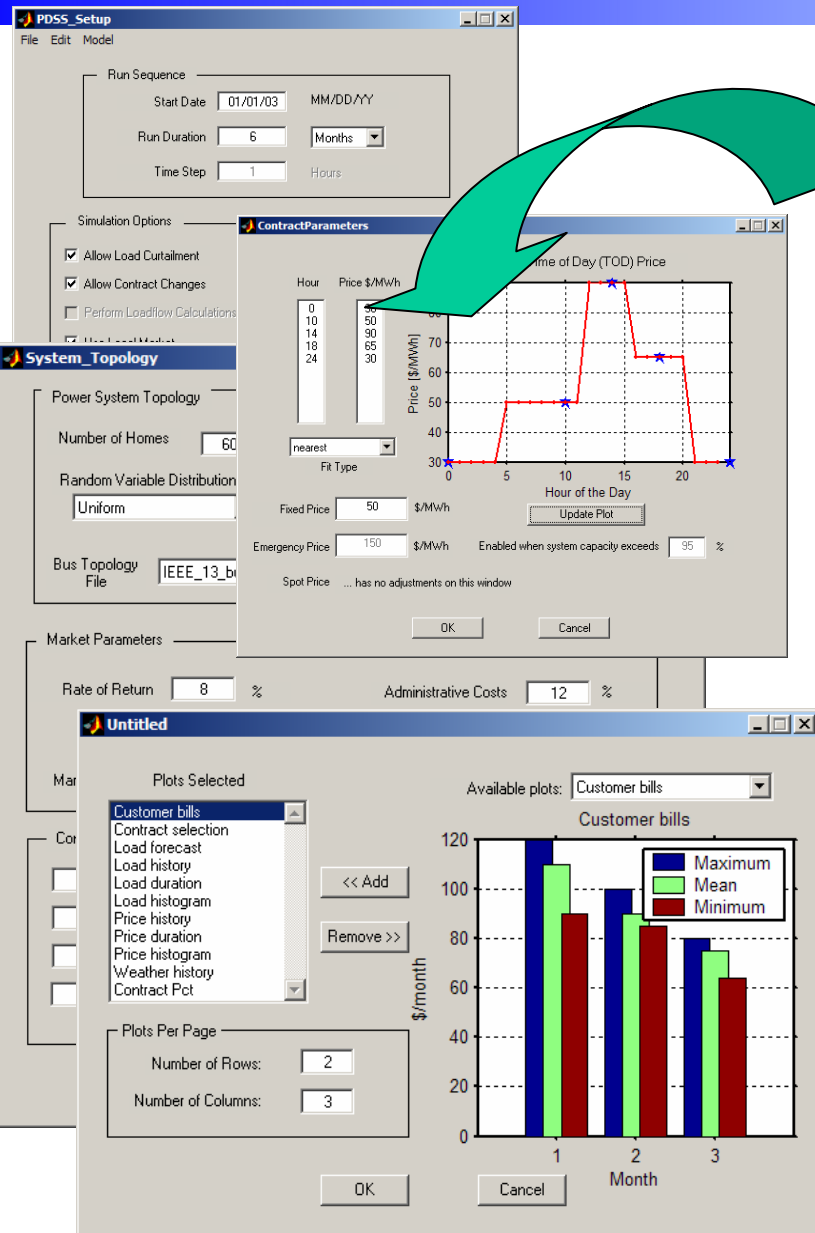
New Members: E2I, Nxegen, BPA, Schneider Electric, AIG Global Energy, and AEP

Ongoing R&D Supporting Smart Distribution Utilities



- Advanced Distribution Simulation, **PNNL**
Interactions of Grid, Economic Behavior, Policy/Regulation

Inputs



Outputs

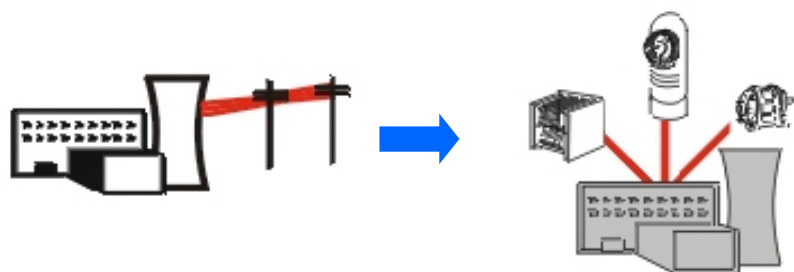


- **Cable Diagnostic Focused Initiative, NEETRAC**

**Assess and enhance nondestructive
diagnostic capabilities for
underground power cable systems**

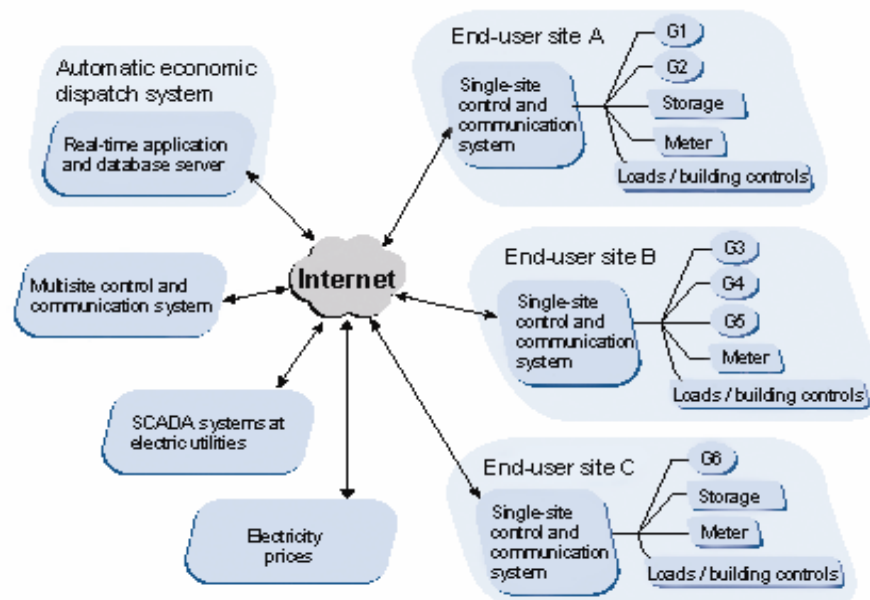
Jointly supported by a group of utilities,
cable manufacturers, and diagnostic service
providers

- Aggregating Distributed Generators, [Electrotek/NYSERDA](#)
- Advanced Communication & Control of DER, [DTE Energy](#)
- Advanced Communication & Control Solutions, [AREVA T&D](#)



Centralized hierarchical control at power plants

DER systems integrated and controlled at multiple sites (<1 to multi-10s MW)



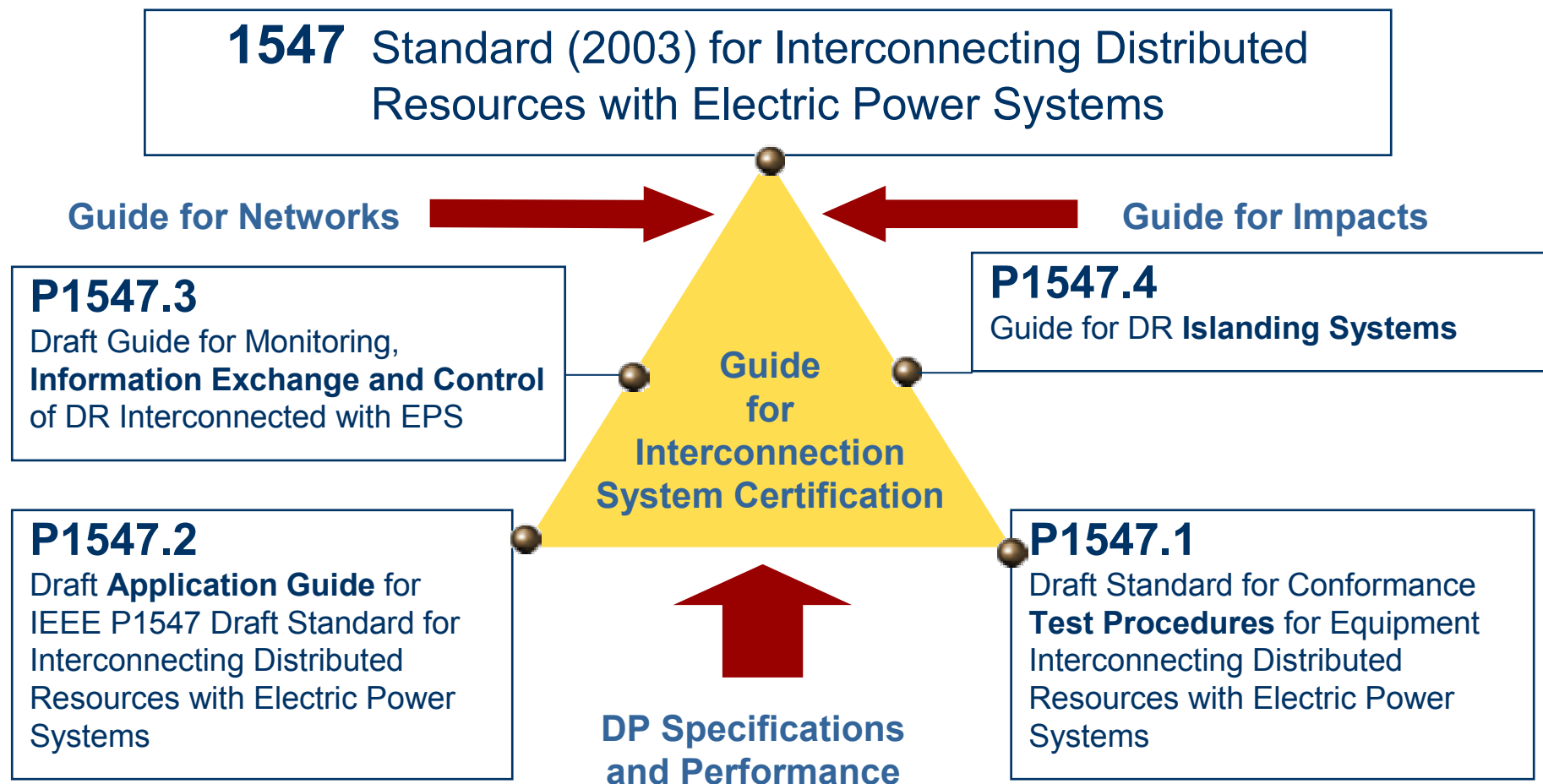
Virtual utilities with aggregated control of integrated DER systems (Multi-100s MW)

2000

2005

2010

- Interconnection Standards Development, [NREL](#)
- Development of a UL Standard for the Interconnection of DG, [UL](#)

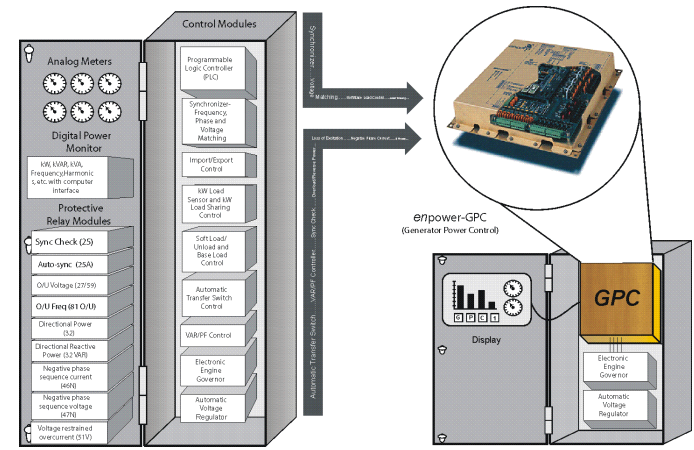


This schematic identifies existing standards development projects and activities under discussion by P1547 Work Group members.

- Innovative Distributed Power Interconnection and Control System, **GTI/Encorp**
- Reliable, Low Cost Distributed Generator/Utility System Interconnect, **GE**
- Interconnection Testing, **NREL**
- Distribution Utility Integration Test, **DUA**

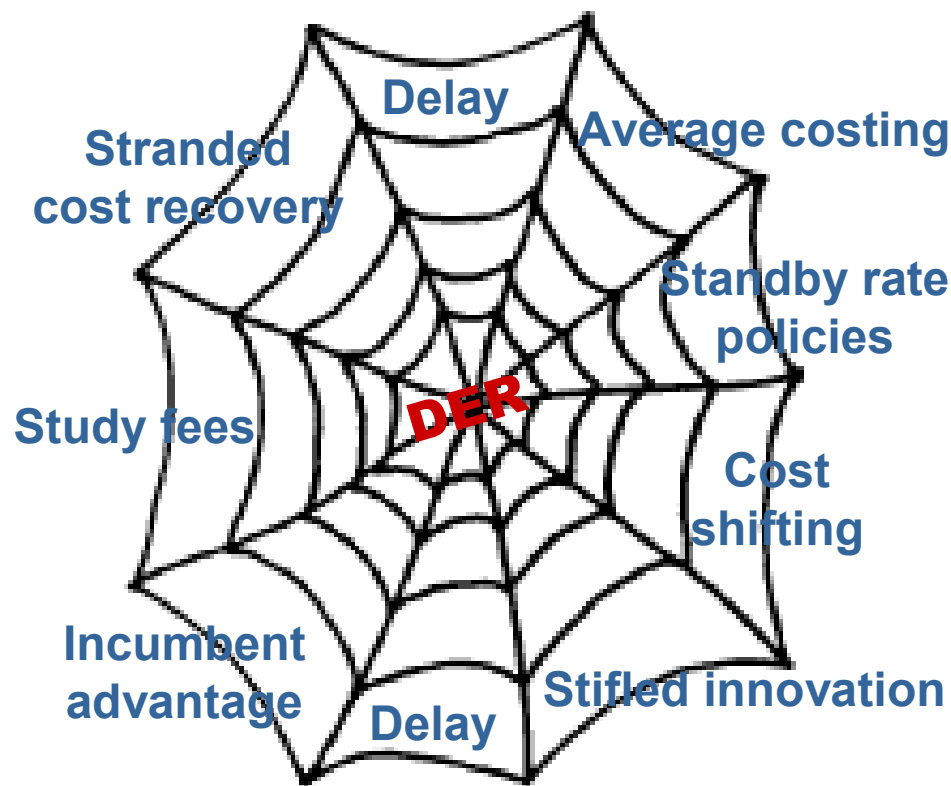


GE Universal Interconnect



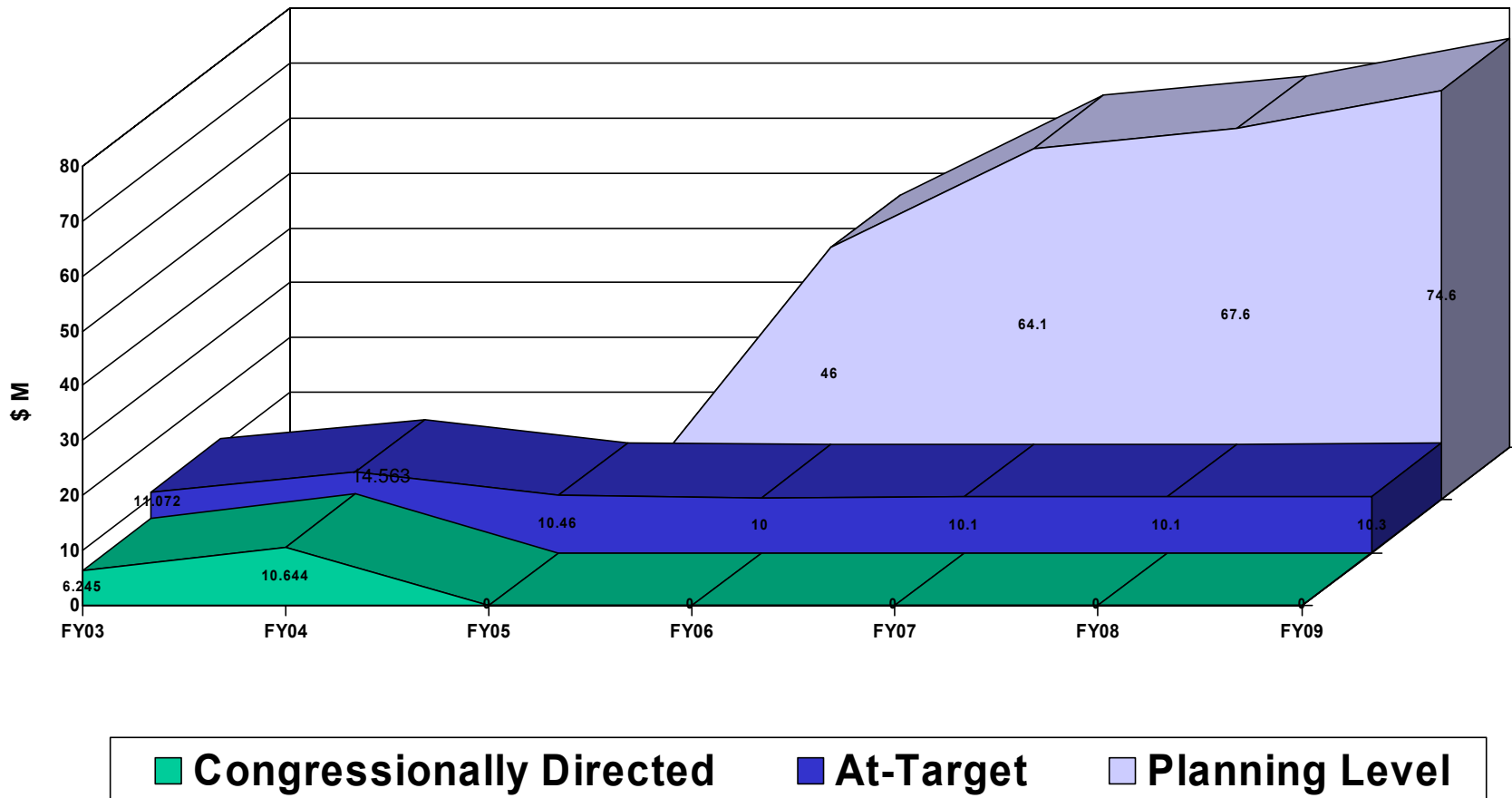
ENCORN GPC Controller

- Regulatory and Institutional Issues, **NREL**



Mid-Atlantic regional small generator initiative to standardize DG interconnection and certification within the PJM control area

Electric Distribution R&D Budget — Combined EDT & GridWise



Challenges:

- Congressionally directed activities
- Funding gap between Planning Level and At-Target Level

Federal Programs

- 2003-2005 SBIR Topic and Subtopic areas
- DOE/EERE: DER aggregation testing
- DOE/OEA & DHS: critical energy infrastructure

State Programs

- CEC, interconnection technology/testing
- NYSERDA, DG aggregation
- Connecticut Demand Response Program, aiming at 30-40% customer participation

Industry & Associations

- IEEE Standards, SCC21 Committee
- CEIDS, Steering Committee and PAGs
- GridWise Alliance & Architecture Board
- Gateway Group, representing 9 major utilities
- NEETRAC

National Labs & Universities

- NREL, interconnection/system integration/regulatory issues
- PNNL, communications/simulation & modeling
- Other NLs & universities, to be developed

International

- IEC TC8 organizational and leadership support
- Information exchanges with CESI (Italy) and Spanish utilities

Leverage resources for high returns from limited R&D funds

- **Strive to continue building/expanding partnerships with private sector to**
 - Jointly pursue common interests and vision
 - Build a strong case for electric distribution R&D to overcome budgetary challenges

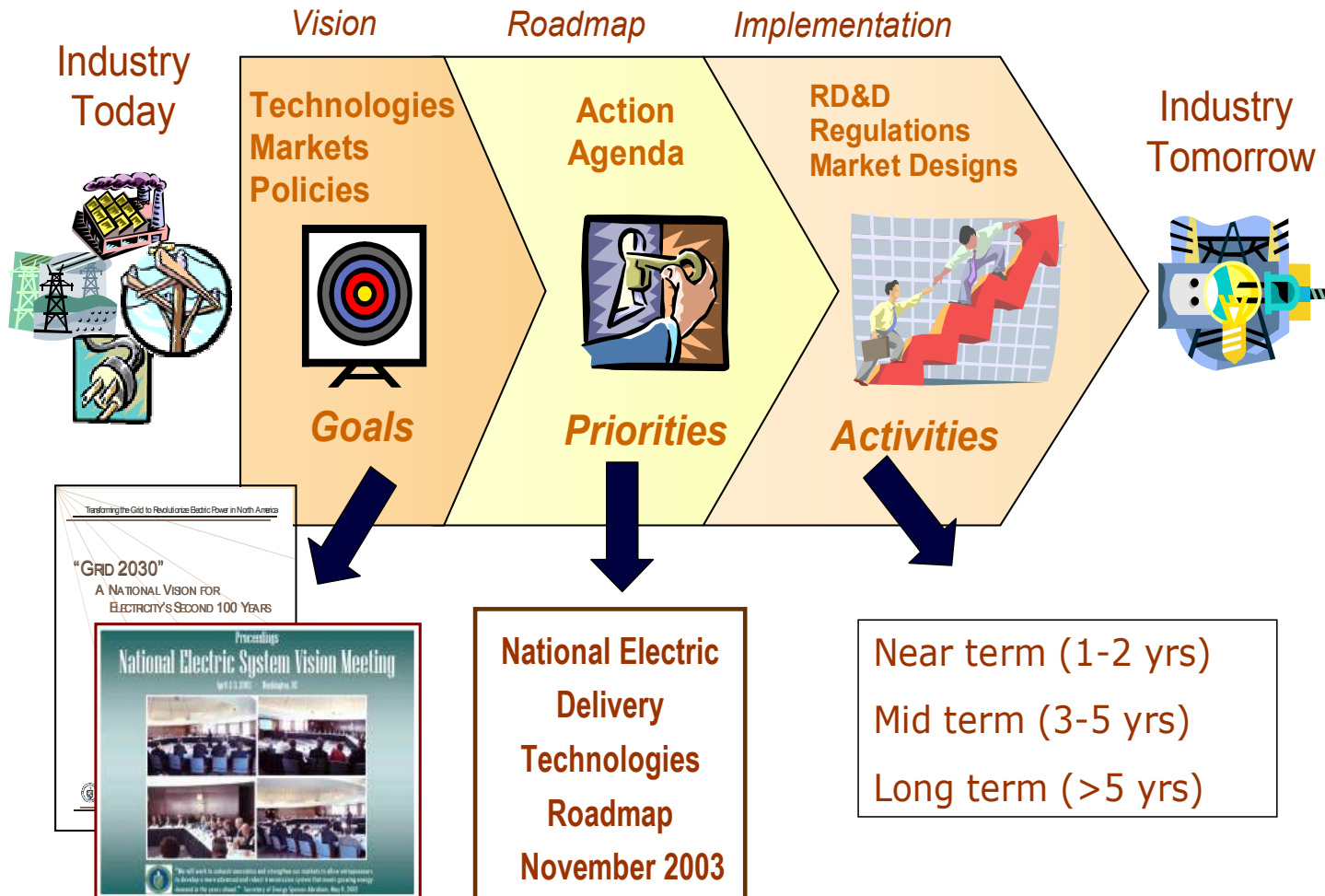
**Partnerships Established
to Date**

GridWise Alliance

CEIDS

Gateway Group (through NEETRAC)

Partnership to Develop/Implement the R&D Agenda



Workshop to build consensus of high-priority R&D activities

Architecture & Communication Standards	Monitoring & Load Management Technologies	Advanced Distribution Technologies & Operating Concepts	Modeling & Simulation
<p>Ron Ambrosio IBM</p> <p>Homer Cotton Southern Co.</p>	<p>Matt Donnelly PNNL</p> <p>Doug Fitchett American Electric Power</p>	<p>Jim Crane Exelon</p> <p>Jonathan Lynch Northern Power</p>	<p>Richard Seguin DTE Energy</p> <p>Devin Van Zandt GE</p>

Co-chairs contributed to topic area development
and will facilitate session discussions



- **Host: Exelon**
- **Organizer: Concurrent Technologies Corporation**
- **Breakout Sessions: Co-chairs and Energetics, Inc.**
- **All Participants**

Thank You

